IN THE CLAIMS:

1. 1.-22.   (Cancelled).

1 23.   (Currently Amended) A storage system, comprising:

2 a destination storage device configured to store a copy of data from a source stor-

3 age device;

4 a first process configured to initiate a copy operation of the source storage device,

5 wherein the copy operation includes is configured to copy~~copying~~ each block of the

6 source storage device to the destination storage device, wherein the copy operation is~~be-~~

7 ~~ing~~ performed in segments, and wherein~~and~~ each segment ~~being~~ is a range of data bytes

8 of the source storage device;

9 the storage system configured to receive a write request to modify a requested

10 range of data bytes of the source storage device while the copy operation of the source

11 storage device is in progress, wherein the write request to modify the requested range of

12 data bytes is a write request range;

13 the storage system further configured to determine if the write request range falls

14 within the range of data bytes of the source storage device being copied while the copy

15 operation is in progress;

16 in response to determining that the write request range falls within the range of

17 data bytes of the source storage device being copied while the copy operation is in pro-

18 gress, the storage system is further configured to determine if a particular range of the

19 range of data bytes of the source storage device to be modified by the write request range

20 has already been written to a snapshot;

21 in response to determining that the particular range of the range of data bytes of

22 the source storage device to be modified by the write request range has already been writ-

23 ten to the snapshot, the write request is configured to be written to the source storage de-

24 vice; and

25 in response to determining that the particular range of the range of data bytes of

26 the source storage device to be modified by the write request range have has not already

27 been written to the snapshot, a second process is configured first to copy the particular

28 range of the range of data bytes of the source storage device to the snapshot, and then the

29 second process is further configured to write the write request to the source storage de-

30 vice.

1 24. (Currently Amended) The storage system of claim 23, further comprising:wherein

2 the source storage device is organized in a RAID system.

1 25. (Currently Amended) The storage system of claim 23, further comprising:wherein

2 the storage system is operablefurther configured, in response to determining the write re-

3 quest range falls within the range of bytes being copied, to hold the write request in a

4 cache and update a snapshot map.

1 26. (Currently Amended) The storage system of claim 23, further comprising:wherein

2 a server configured to execute the first process and the second processis executed on a

3 file server.

1 27. (Currently Amended) The storage system of claim 26, further comprising:wherein

2 the file-server is operatively connected to a storage area network switch and the file

3 server is further configured to communicates with the storage system through the storage

4 area network switch.

1 28. (Currently Amended) The storage system of claim 23, further comprising:wherein

2 the process is operable configured to control multiple storage systems.

1 29. (Currently Amended) The storage system of claim 23, further comprising:wherein

2 the write request includes SCSI commands.

30. (Currently Amended) The storage system of claim 23, ~~further comprising:~~wherein the storage system is ~~operable~~ further configured to send one or more commands by using an in-band protocol.

31. (Currently Amended) A method, comprising:

starting a copy command from a source storage device to a destination storage device wherein the copy command copies each block of the source storage device to the destination storage device, the copy command being performed in segments and each segment specifying a range of data bytes of the source storage device;

receiving a write request to modify a requested range of data bytes of the source storage device while the copy command is in progress, wherein the write request to modify the requested range of data bytes is a write request range;

determining if the write request range falls within the range of data bytes ~~being of~~ the source storage device being copied;

determining, in response to the write request range ~~being~~ falling within~~in~~ the range of data bytes of the source storage device being copied, if a particular range of the range of data bytes of the source storage device to be modified by the write request range has already been written to a snapshot;

writing, in response to the particular range of the range of data bytes of the source storage device to be modified by the write request range having already been written to the snapshot, the write request to the source storage device; and

copying, in response to the particular range of the range of data bytes of the source storage device to be modified by the write request range having not already been written to the snapshot, the particular range of the range of data bytes to the snapshot, and then writing the write request to the source storage device.

32. (Currently Amended) The method of claim 31, ~~further comprising:~~wherein the source is organized~~using in~~ a RAID system~~ as the source~~.

33. (Currently Amended) The method of claim 31, further comprising:

2   in response to determining the write request range falls within the range of data

3   bytes of the source <u>storage device</u> being copied, holding the write request command in a

4   cache, and updating a snapshot map associated with the snapshot.

1   34.   (Previously Presented) The method of claim 31, further comprising:

2   executing the copy command by a replication manager.

1   35.   (Currently Amended) The method of claim 31, further comprising:

2   connecting a ~~file~~-server to a storage area network switch and <u>communicating</u>~~the~~

3   ~~file server communicates~~ with a storage system through the storage area network switch

4   to execute the copy command ~~the storage system~~.

1   36.   (Previously Presented) The method of claim 31, further comprising:

2   controlling multiple storage device controllers by a replication manager.

1   37.   (Currently Amended) The method of claim 31, ~~further comprising:~~<u>wherein the</u>

2   <u>write request comprises</u> ~~including~~ a SCSI command ~~in the write request~~.

1   38.   (Previously Presented) The method of claim 31, further comprising:

2   sending a storage system commands using one of an in-band protocol or an out-

3   of-band protocol.

1   39.   (Currently Amended) A computer-implemented method<u>,</u> comprising:

2   starting a copy operation by copying data from a source <u>storage device</u> to a desti-

3   nation <u>storage device</u>, the copy operation being performed in segments, and each segment

4   having a range of data bytes of the source;

5   receiving a write request to modify a requested range of data bytes of the source

6   <u>storage device</u> while the copy operation is in progress, wherein the write request to mod-

7   ify the requested range of data bytes is a write request range;

8   determining if the write request range falls within the range of data bytes of the

9 source <u>storage device</u> being copied;

10   determining, in response to the write request range being in the range of data

11 bytes of the source <u>storage device</u> being copied, if <u>a particular range of</u> the range of data

12 bytes of the source <u>storage device to be modified by the write request range</u> has been

13 written to a snapshot;

14   writing, in response to the range of data bytes of the source <u>storage device to be</u>

15 <u>modified by the write request range</u> having been written to the snapshot, the write request

16 to the source <u>storage device</u>; and

17   copying, in response to the range of data bytes of the source <u>storage device to be</u>

18 <u>modified by the write request range</u> having not ~~being~~ <u>been</u> written to the snapshot, the

19 <u>particular range of the</u> range of data bytes of the source <u>storage device</u> to the snapshot,

20 and then writing the write request to the source <u>storage device</u>.

1 40.   (Currently Amended) A system<u>,</u> comprising:

2   a destination <u>storage device</u> to store a copy from a source <u>storage device</u>;

3   a first process to initiate a copy operation of the source <u>storage device</u> wherein the

4 copy operation includes copying each block of the source <u>storage device</u> to the destina-

5 tion <u>storage device</u>, the copy operation being performed in segments, and each segment

6 having a range of data bytes of the source <u>storage device</u>;

7   the system to receive a write request to modify a requested range of data bytes of

8 the source <u>storage device</u> while the copy operation is in progress, wherein the write re-

9 quest to modify the requested range of data bytes is a write request range;

10   the system to determine if the write request range falls within the range of data

11 bytes of the source <u>storage device</u> being copied;

12   in response to determining that the write request range falls within the range of

13 bytes of the source <u>storage device</u> being copied, the system to determine if <u>a particular</u>

14 <u>range of</u> the range of data bytes of the source <u>storage device to be modified by the write</u>

15 <u>request range</u> have been written to a snapshot;

6

16   in response to determining that the <u>particular range of the</u> range of data bytes of

17 the source <u>storage device to be modified by the write request range</u> have been written to

18 the snapshot, the write request to be written to the source <u>storage device</u>; and

19   in response to determining that the <u>particular range of the</u> range of data bytes of

20 the source <u>storage device to be modified by the write request range</u> have not been written

21 to the snapshot, a second process to copy the <u>particular range of the</u> range of data bytes of

22 the source <u>storage device</u> to the snapshot, and then the second process to write the write

23 request to the source<u> storage device</u>.

1 41.   (Currently Amended) The system of claim 40, ~~further comprising:~~<u>wherein</u> the

2 <u>first process and the second</u> process ~~is~~<u>are</u> executed on a file server and is ~~operable~~<u>con-</u>

3 <u>figured</u> to control the source <u>storage device</u> and one or more other storage devices.

1 42.   (Currently Amended) The system of claim 40, ~~further comprising:~~<u>wherein</u> a list

2 <u>comprising</u>~~of~~ source <u>storage device</u> data blocks to be copied <u>is configured to be</u>~~that are~~

3 reordered ~~to increase copy speed~~.

1 43.   (Currently Amended) The system of claim 42, ~~further comprising:~~<u>wherein</u> the list

2 of blocks to be copied is buffered while the system awaits further copy commands.

1 44.   (Currently Amended) The system of claim 40, ~~further comprising~~<u>wherein</u>~~:~~ the

2 <u>first</u> process <u>and the second process are</u>~~is~~ <u>configured</u> ~~operable~~ to insert control data be-

3 fore and after a source <u>storage device</u> data block is copied.

1 45.   (Currently Amended) The system of claim 40, ~~further comprising:~~<u>wherein</u> the

2 <u>first</u> process <u>and the second process</u> ~~is~~<u>are</u> <u>configured</u>~~operable~~ to specify a block size so

3 that the storage system writes<u> one or more</u> fixed-size blocks.

1 46.   (Currently Amended) A method, comprising:

2   receiving a write request while a copy operation is in progress wherein the copy

3   operation includes copying each block of the source to the destination, the copy ~~operating~~

4   operation being performed in segments, and each segment has a range of data bytes of the

5   source, the write request to modify a requested range of data bytes in a source storage

6   device, wherein the write request to modify the requested range of data bytes is a write

7   request range;

8   determining if the write request range being copied falls within a particular range

9   of the range of bytes of the source storage device to be modified by the write request

10   range~~being copied~~;

11   determining that the particular range of the range of bytes of the source storage

12   device to be modified by the write request range have not been written to a snapshot;

13   in response to determining that the particular range of the range of bytes of the

14   source storage device to be modified by the write request range have not been written to

15   the snapshot, copying the particular range of the range of bytes of the source storage de-

16   vice to be modified by the write request range to the snapshot before modifying the par-

17   ticular range of the range of bytes of the source storage device;

18   updating a snapshot map, wherein the snapshot map indicates which blocks of the

19   range of bytes are located in the snapshot; and

20   modifying the particular range of the range of bytes of data in the source storage

21   device from the write request.

1   47.   (Currently Amended) The storage system of claims 23, further comprising:

2   ~~the write request being placed in~~ a first in first out queue configured to buffer the

3   write request in response to determining that the particular range of the range of data

4   bytes of the source storage device to be modified by the write request range have not

5   been written to the snapshot.

1   48.   (Currently Amended) The method of claims 31, further comprising:

2   placing the write request in a first in first out queue in response to determining

3   that the particular range of the range of data bytes of the source storage device to be

4   modified by the write request range have not been written to the snapshot.

1   49.   (Currently Amended) A computer-readable storage media containing executable

2   program comprising instructions executed by for execution in a processor for the practice

3   of a method of operating a server, comprising:

4   program instructions that receivereceiving at a source storage device a write re-

5   quest issued from a file storage system, the write request specifying a first range of data

6   bytes of the source storage device, the write request being received while the source stor-

7   age device is being copied to a destination storage device; and

8   in response to receiving the write request, program instructions that holding the

9   write request in a cache;.

10   program instructions that checking if the first range overlaps with a second range,

11   wherein the second range is a particular range of the range of data bytes of the source

12   storage device to be modified by the write request that is being copied to the destination

13   storage device,;

14   in response to the first range overlapping with the second range of data bytes of

15   the source storage device to be modified by the write request if so, program instructions

16   that copying the second range from the source storage device to the a snapshot;.

17   program instructions that updateing a snapshot map;. and

18   program instructions that then allowing the write request to write to the source

19   storage device.

1   50.   (Currently Amended) A method for making a copy of data in a database, compris-

2   ing:

3   starting a copying operation of a source storage device to a destination storage

4   device, wherein the copy operation is performed in segments and each segment is a range

5   of data bytes of the source storage device, the copy operation started at a begin time;

6   maintaining a snapshot volume that includes each block of the source storage de-

7   vice that has a write request directed to that block during the course of the copy opera-

8   tion;

9   receiving a write request directed to a particular range of the range of data bytes

10 to be modified by the write request range that currently is being ~~currently~~ copied to the

11 destination storage device;

12 in response to determining that the particular range of the range of bytes to be

13 modified by the write request range have not been copied to the snapshot volume, hold-

14 ing the write request until the particular range of the range of bytes to be modified by the

15 write request range are copied to the snapshot volume;

16 after completion of writing the particular range of the range of bytes to be modi-

17 fied by the write request range to the snapshot volume, executing the write request on the

18 source storage device to update the source storage device ~~with a changed data~~; and

19 copying the snapshot volume to the destination storage device, wherein the copied

20 snapshot volume ~~in order to~~ maintains a copy of a data on the destination storage device

21 as the data existed on the source storage device at the begin time.

1   51.   (Currently Amended) A system to make a copy of data in a database, comprising:

2   a process executing on a processor of the system configured to initiate a copy op-

3   eration of a source storage device to a destination storage device, wherein the copy opera-

4   tion is performed in segments and each segment is a range of data bytes of the source

5   storage device, the copy operation started at a begin time;

6   the system configured to maintain a snapshot volume that includes each block of

7   the source storage device that has a write request directed to that block during the course

8   of the copy operation;

9   the system is further configured to receive a write request directed to the range of

10 data bytes ~~being~~ currently being copied to the destination storage device;

11 in response to determining that a particular range of the range of bytes to be modi-

12 fied by the write request range ~~have~~ has not been copied to the snapshot volume, the sys-

13 tem is further configured to hold the write request until the particular range of the range

14 of bytes to be modified by the write request range are copied to the snapshot volume;

15   after completion of writing the particular range of the range of bytes to be modi-

16 fied by the write request range to the snapshot volume, the system is further configured to

17 execute the write request on the source storage device to update the source with a

18 changed data; and

19   the system is further configured to copy copying the snapshot volume to the desti-

20 nation storage device, in order wherein the copied snapshot volume is configured to

21 maintain a copy of a data on the destination storage device as the data existed on the

22 source storage device at the begin time.

1   52.   (Currently Amended) A computer-readable storage media containing executable

2 program comprising instructions executed by for execution in a processor for the practice

3 of a method of operating a server, comprising:

4   program instructions that starting a copying operation of a source storage device

5 to a destination storage device, wherein the copy operation is performed in segments and

6 each segment is a range of data bytes of the source storage device, the copy operation

7 started at a begin time;

8   program instructions that maintaining a snapshot volume that includes each block

9 of the source storage device that has a write request directed to that block during the

10 course of the copy operation;

11   program instructions that receive receiving a write request directed to a particular

12 range of the range of data bytes to be modified by the write request range that currently is

13 being currently copied to the destination storage device;

14   in response to determining that the particular range of the range of bytes to be

15 modified by the write request range have not been copied to the snapshot volume, pro-

16 gram instructions that holding the write request until the particular range of the range of

17 bytes to be modified by the write request range are copied to the snapshot volume;

18   program instructions that, after completion of writing the particular range of the

19 range of bytes to be modified by the write request range to the snapshot volume, execute-

20 ~~executing~~ the write request on the source <u>storage device</u> to update the source <u>storage de-</u>

21 <u>vice</u>~~with a changed data~~; and

22   <u>program instructions that</u> copy~~ing~~ the snapshot volume to the destination <u>storage</u>

23 <u>device, wherein the copied snapshot volume</u>~~in order to~~ maintain<u>s</u> a copy of a data on the

24 destination <u>storage device</u> as the data existed on the source <u>storage device</u> at the begin

25 time.

1   53.   (Currently Amended) The storage system of claim 23, ~~further comprising:~~<u>wherein</u>

2   the storage system is ~~operable~~ <u>configured</u> to send one or more commands by using an

3   out-<u>of-</u>band protocol.

1   54.   (Currently Amended) The method of claim 31, further comprising:

2   in response to determining that the write request range does not fall within the

3   <u>particular range of the</u> range of data bytes of the source <u>storage device</u> being copied, de-

4   termining if the write request range is directed to a <u>next particular range of the</u> range of

5   data bytes that ~~have~~<u>has</u> not yet been <u>written to the snapshot</u>~~copied~~; and

6   in response to determining that the write request range is directed to the <u>next par-</u>

7   <u>ticular range of the</u> range of data bytes that ~~have~~<u>has</u> not yet been ~~copied~~<u>written</u> to the

8   snapshot, copying~~,~~ the <u>next particular range of the</u> range of bytes not yet ~~copied~~<u>written</u>~~,~~ to

9   the snapshot.